PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application No.:	10/633,764
Filing Date:	August 4, 2003
Applicants:	Yihua Chang et al.
Group Art Unit:	1794
Examiner:	Michael C. Miggins
Title:	Membranes with Fluid Barrier Properties and Articles Containing Such Membranes
Docket No .:	4022-000009

Commissioner of Patents
Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Appeal Brief Under 37 C.F.R. § 41.37

Sir:

This Appeal Brief is filed in support of an appeal from the final Office Action mailed February 4, 2008, finally rejecting all pending claims. A Notice of Appeal was filed on June 4, 2008 appealing all rejections. This Brief is due, without extension, on August 4, 2008.

This Brief is accompanied by the fee under 37 C.F.R. § 41.20(b)(2).

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Real Party in Interest

The real party in interest is Nike, Inc., a corporation of the State of Oregon, to which the inventors assigned all rights in this invention. The assignment was recorded in the United States Patent and Trademark Office on August 4, 2003 at reel 014371, frame 0890.

Related Appeals and Interferences

There are no related appeals or interferences.

Status of Claims

Claims 1, 4-28, and 30-54, are pending in the application and stand finally rejected. Claims 2, 3, and 29 have been cancelled. This appeal is taken as to all of the rejected claims, claims 1, 4-28, and 30-54.

Status of Amendments

No amendment was filed after the final rejection.

Summary of Claimed Subject Matter

Applicants claim in independent claim 1 a rėsilient membrane comprising a microlayer polymeric composite layer having at least 10 microlayers that alternate between an elastomeric material and a polymeric fluid barrier material comprising a laminar nano-filler. Page 23, lines 4-7; page 26, lines 15-17; Figs. 2 (membrane 110 with microlayer polymeric composite layer 124) & 3 (microlayer polymeric composite layer 124 with elastomeric material layers such as layer 142 and polymeric fluid barrier material layers 140) as described at page 28, line 16 to page 29, line 14 A "membrane" is a free-standing film separating one fluid from another. Page 5, lines 2-6 (first four lines of paragraph 10); Figures 1 and 2. The elastomeric material provides resiliency and dimensional stability to the membrane, while the polymeric fluid barrier material prevents transfer of a fluid through the membrane. Page 4, lines 12-15 (paragraph 8, lines 8-11). The microlayer polymeric composite layer has at least 10 microlayers, each up to about 2.5 microns thick. Page 23, lines 12-13 & page 24, lines 6-7. The laminar nano-filler has average platelet thickness of up to about 10 nanometers, an average aspect ratio of at least about 200, and at least one of height and width of from about 0.1 micron to about 1.5 microns to achieve improved barrier properties without reduced resilience of the membrane. Page 4, lines 15-18 (paragraph 8, lines 11-14).

Claims 4-12 depend on claim 1.

Independent claim 13 claims a resilient membrane that comprises at least one elastomeric layer comprising an elastomeric material and at least one barrier layer comprising a microlayer polymeric composite layer. Page 7, lines 12-16; page 28, line 1 to page 29, line 14; Fig. 1 (membrane with elastomeric layers 12, 14, 18, 20 and layer 16 of polymeric fluid barrier

material); Fig. 2 (elastomer layers 114, 118, 122, 126 and microlayer polymeric composite layer 124). The microlayer polymeric composite layer is defined in the same way as in claim 1.

Claims 14-27 depend on claim 13.

Independent claim 28 claims a bladder comprising an elastomeric barrier membrane. Page 29, lines 15-17. The membrane has a microlayer polymeric composite layer having at least about 10 microlayers, each microlayer individually being up to about 100 microns thick, said microlayers alternating between at least one polymeric gas barrier material and at least one elastomeric material. Figures 2 and 3; page 28, line 16 to page 29, line 14. The microlayers of polymeric fluid barrier material or the microlayers of elastomeric material, or both, comprise a laminar nano-filler as described for claim 1. Page 28, lines 1-3 & 16-17 (paragraph 58, lines 1-3 & paragraph 59, lines 1-2); Figures 2 and 3. Figures 2 and 3 illustrate membranes having a microlayer polymeric composite layer 124.

The microlayer polymeric composite layer is particularly aided by including the nano-filler because the process of forming the microlayers tends to align the nano-filler generally parallel to the faces of the microlayer polymeric composite layer. Page 26, lines 16-23 (paragraph 56).

Claims 30-54 depend on claim 28.

Grounds of Rejection to Be Reviewed on Appeal

Claims 1 and 4-27 stand rejected under 35 U.S.C. 103(a) as unpatentable over Bonk et al., U.S. Patent No. 6,082,025 in view of Mueller et al., U.S. Patent No. 6,403,231.

Claims 28 and 30-54 stand rejected under 35 U.S.C. 103(a) as unpatentable over Bonk et al., U.S. Patent No. 6,082,025 in view of Mueller et al., U.S. Patent No. 6,403,231.

Argument

I. Claims 1 and 4-27 are patentable over Bonk et al., U.S. Patent No. 6,082,025 in view of Mueller et al., U.S. Patent No. 6,403,231.

A. Claims 1 and 4-27 are patentable over Bonk et al., U.S. Patent No. 6,082,025 in view of Mueller et al., U.S. Patent No. 6,403,231 because the patents teach away from making such a combination.

A person of ordinary skill in the art, beginning with the Bonk membrane, would be led away from including the Mueller modified clay particles to make a resilient membrane because the Mueller patent teaches that its particles make a film stiffer. "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley,* 27 F.3d 551, 553, 31 U.S.P.Q.2d 1130, 1131 (Fed. Cir. 1994).

Applicant explains in the Background and Summary sections of the specification that, while better barrier properties are desirable for membranes used in making inflated bladders, it is likewise desirable to maintain the resilience of such membranes. Specification, paragraph 3, last sentence ("It would be preferred from the standpoint of maintaining membrane resiliency to reduce gas transmission rate by a method that does not substantially increase the stiffness of the membrane."); paragraph 6, last line ("The Tokoh et al. materials [laminates of filled EVOH and polyolefin] do not have the resiliency required for cushioning devices and many inflated articles."); paragraph 8, third sentence ("The elastomeric material provides resiliency and dimensional stability to the membrane of the invention, while the polymeric fluid barrier material allows the membrane to prevent the transfer of a fluid from one side of the membrane to the other.").

The Mueller patent, on the other hand, teaches away from a resilience membrane by teaching, as one benefit, that the stiffness of its laminate sheet is increased with the added filler. See col. 6, lines 33-40; Example 18, columns 13-14. This is the same undesirable rsult one of art faced regarding improving barrier properties in a resilient membrane for inflated bladders discussed in Applicant's Background. The Mueller patent thus would lead one away from modifying the Bonk membrane to attain the membrane Applicant claims in which there is no appreciable decrease in membrane resilience.

The Examiner relies on Mueller column 6, lines 41-54 for teaching that the Mueller laminate films are flexible, Office Action of 2/4/08 page 3, drawing from this statement two unsupported conclusions: (1) that if the film is flexible, it must be resilient and (2) that is the film is flexible then incorporating the nanofiller has not altered its "resiliency" vis-à-vis an unfilled film.

However, resilience and flexibility are not the same thing. "Resilience" refers to the "ability to regain an original shape quickly after being strained or distorted." *Engineering Materials Handbook: Volume 1, Composites,* at page 20 (ASM International Handbook Committee, Theodore J. Reinhard, Technical Chairman 1987). Applicant's "resilience" must be interpreted in this way. See Specification, paragraph 3, last sentence ("It would be preferred from the standpoint of maintaining membrane resiliency to reduce gas transmission rate by a method that does not substantially increase the stiffness of the membrane."); paragraph 8, third sentence ("The elastomeric material provides resiliency and dimensional stability to the membrane of the invention, while the polymeric fluid barrier material allows the membrane to prevent the transfer of a fluid from one side of the membrane to the other."). The Mueller sheets do not include any elastomeric materials and are, therefore, not resilient. The Mueller sheet may

be flexible in the same way as aluminum foil and paper are flexible, but it cannot be regain its original shape if distorted under a strain.

Therefore, one could not have had an expectation of success in including the Mueller nano-filler if one wished to make a resilient membrane.

B. Claims 1 and 4-27 are patentable over Bonk et al., U.S. Patent No. 6,082,025 in view of Mueller et al., U.S. Patent No. 6,403,231 because the combined patents do not teach, disclose, or suggest the claim element of "at least one of height and width being independently from about 0.1 micron to about 1.5 microns" that is found in each of these claims.

For prima facie obviousness, the combined Bonk and Mueller patents must suggest the invention as claimed. The combined patents, however, do no suggest the claimed membrane containing "a laminar nano-filler having . . . at least one of height and width being independently from about 0.1 micron to about 1.5 microns."

The Bonk patent does not mention laminar nano-fillers, as the Examiner admits. Office Action mailed 2/4/08, page 3. The Examiner relies on this description in the Mueller patent of its layered clay minerals in column 3, lines 30-44 as disclosing Appellant's claim element: "The thickness of the sheets is about 1 nm and the diameter of the sheets in typically from 50 to 1000 nm . . . ." A diameter, however, is neither a height nor a width. Therefore, the Examiner has not shown a reason in the prior art to modify the Bonk patent membrane in a way that would result in Appellant's claimed invention. The Examiner has merely stated that the Mueller passage in column 3, lines 30-44 "discloses a laminar montmorillonite nano-filler having . . . at least one of height and width being independently from about 0.1 to about 1.5 [sic]," Office Action mailed

2/4/08, page 3. This statement is in error, however, and thus the Examiner has failed to show prima facie obviousness.

For these reasons, Appellant respectfully requests this Honorable Board to REVERSE the rejection over Bonk et al., U.S. Patent 6,082,025 over Mueller et al., U.S. Patent 6,403,231.

II. Claims 28 and 30-54 are patentable over Bonk et al., U.S. Patent No. 6,082,025 in view of Mueller et al., U.S. Patent No. 6,403,231 because, once again, the patents teach away from making such a combination and do not suggest including a nano-filler at least one of height and width being independently from about 0.1 micron to about 1.5 microns.

Claim 28, similarly to independent claims 1 and 13, comprises an elastomeric barrier membrane. As discussed in regard to claims 1 and 4-27, the Mueller patent teaches away from making an elastomeric or resilient membrane by using materials that are not elastomeric and teaching that its clay filler stiffens its films. Again as discussed in regard to claims 1 and 4-27, the Mueller patent teaches a diameter dimension, but does not discuss particles that have a height and width. Thus, the rejection of claims 28 and 30-54 is fails to make out prima facie obviousness for the same reasons set out in Argument Section I.

Thus, for these reasons, Appellants respectfully request this Honorable Board to REVERSE the rejection,

Conclusion

The present claims are patentable over the cited art. Applicants, therefore, respectfully petition this Honorable Board to reverse the final rejection of the claims on each ground and to indicate that all claims are allowable.

Respectfully submitted,

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Claim Appendix

Copy of the Claims Appealed

1. A resilient membrane, comprising a microlayer polymeric composite layer having at least 10 microlayers, each said microlayer individually being up to about 2.5 microns thick, said microlayers alternating between an elastomeric material and a polymeric fluid barrier material comprising a laminar nano-filler having an average platelet thickness of up to about 10 nanometers, an average aspect ratio of at least about 200, and at least one of height and width being independently from about 0.1 micron to about 1.5 microns, wherein the amount of the laminar nano-filler does not appreciably decrease the resilience of the membrane.

4. A membrane according to claim 1, wherein the elastomeric material is selected from the group consisting of polyurethane elastomers, flexible polyolefins, styrenic thermoplastic elastomers, polyamide elastomers, polyamide-ether elastomers, ester-ether and ester-ester elastomers, flexible ionomers, thermoplastic vulcanizates, flexible poly(vinyl chloride) homopolymers and copolymers, flexible acrylic polymers, and combinations thereof.

5. A membrane according to claim 1, wherein the elastomeric material is selected from the group consisting of thermoplastic polyester-polyurethanes, thermoplastic polyether-polyurethanes, thermoplastic polycarbonate-polyurethanes, and combinations thereof.

6. A membrane according to claim 1, wherein the polymeric fluid barrier material is selected from the group consisting of ethylene-vinyl alcohol copolymers, poly(vinyl chloride), polyvinylidene polymers and copolymers, polyamides, acrylonitrile polymers, polyurethane

engineering plastics, poly(methyl pentene) resins, ethylene-carbon monoxide copolymers, liquid crystal polymers, polyesters, polyimides, and combinations thereof.

7. A membrane according to claim 1, wherein the polymeric fluid barrier material comprises an ethylene-vinyl alcohol copolymer.

8. A membrane according to claim 1, wherein the laminar nano-filler has an average thickness of from about 1 nm to about 10 nm and an aspect ratio from about 200 to about 1000.

9. A membrane according to claim 1, wherein the laminar nano-filler is a montmorillonite clay.

10. A membrane according to claim 1, wherein the membrane comprises from about 4 to about 10 weight percent of the laminar nano-filler.

11. A permanently sealed, inflated bladder comprising a membrane according to claim 1.

12. A permanently sealed, inflated bladder comprising a membrane according to claim 1.

13. A resilient membrane, comprising at least one elastomeric layer comprising an elastomeric material and at least one barrier layer comprising a microlayer polymeric composite layer having at least 10 microlayers, each said microlayer individually being up to about 2.5 microns thick, said microlayers alternating between an elastomeric material and a polymeric fluid

barrier material comprising a laminar nano-filler having an average platelet thickness of up to about 10 nanometers, an average aspect ratio of at least about 200, and at least one of height and width being independently from about 0.1 micron to about 1.5 microns, wherein the amount of the laminar nano-filler does not appreciably decrease the resilience of the membrane.

14. A membrane according to claim 13, wherein the elastomeric material is selected from the group consisting of polyurethane elastomers, flexible polyolefins, styrenic thermoplastic elastomers, polyamide elastomers, polyamide-ether elastomers, ester-ether and ester-ester elastomers, flexible ionomers, thermoplastic vulcanizates, flexible poly(vinyl chloride) homopolymers and copolymers, flexible acrylic polymers, and combinations thereof.

15. A membrane according to claim 13, wherein the elastomeric material is selected from the group consisting of thermoplastic polyester-polyurethanes, thermoplastic polyether-polyurethanes, thermoplastic polycarbonate-polyurethanes, and combinations thereof.

16. A membrane according to claim 13, wherein the polymeric fluid barrier material is selected from the group consisting of ethylene-vinyl alcohol copolymers, poly(vinyl chloride), polyvinylidene polymers and copolymers, polyamides, acrylonitrile polymers, polyurethane engineering plastics, poly(methyl pentene) resins, ethylene-carbon monoxide copolymers, liquid crystal polymers, polyesters, polyimides, and combinations thereof.

17. A membrane according to claim 13, wherein the polymeric fluid barrier material comprises an ethylene-vinyl alcohol copolymer.

18. A membrane according to claim 13, wherein the laminar nano-filler has an average thickness of from about 1 nm to about 10 nm and an aspect ratio from about 200 to about 1000.

19. A membrane according to claim 13, wherein the laminar nano-filler is a montmorillonite clay.

20. A membrane according to claim 13, wherein the membrane comprises from about 4 to about 10 weight percent of the laminar nano-filler.

21. A permanently sealed, inflated bladder comprising a membrane according to claim 13.

22. A permanently sealed, inflated bladder comprising a membrane according to claim 15.

23. A permanently sealed, inflated bladder comprising a membrane according to claim 17.

24. A permanently sealed, inflated bladder comprising a membrane according to claim 18.

25. A permanently sealed, inflated bladder comprising a membrane according to claim 20.

26. A bladder according to claim 21, wherein said bladder is inflated with a gas comprising nitrogen.

27. A bladder according to claim 24, wherein said bladder is inflated with a gas comprising nitrogen.

28. A bladder, comprising an elastomeric barrier membrane, wherein:

said membrane comprises a microlayer polymeric composite layer having at least about 10 microlayers, each microlayer individually being up to about 2.5 microns thick, said microlayers alternating between at least one polymeric fluid barrier material and at least one elastomeric material;

and further wherein said microlayers of polymeric fluid barrier material comprise a laminar nano-filler having an average platelet thickness of up to about 10 nanometers, an average aspect ratio of at least about 200, and at least one of height and width being independently from about 0.1 micron to about 1.5 microns, wherein the amount of the laminar nano-filler does not appreciably decrease the resilience of the membrane.

30. A bladder according to claim 28, wherein said elastomeric material comprises a member selected from the group consisting of polyurethane elastomers, flexible polyolefins, styrenic thermoplastic elastomers, polyamide elastomers, polyamide-ether elastomers, ester-ether elastomers, ester-ester elastomer, flexible ionomers, thermoplastic vulcanizates, flexible poly(vinyl chloride) homopolymers and copolymers, flexible acrylic polymers, and combinations thereof.

31. A bladder according to claim 28, wherein said elastomeric material includes a polyurethane elastomer.

32. A bladder according to claim 28, wherein said elastomeric material includes a member of the group consisting of thermoplastic polyester diol-based polyurethanes, thermoplastic polyether diol-based polyurethanes, thermoplastic polycaprolactone diol-based polyurethanes, thermoplastic polytetrahydrofuran diol-based polyurethanes, thermoplastic polycarbonate diol-based polyurethanes, and combinations thereof.

33 A bladder according to claim 32, wherein the elastomeric material comprises a thermoplastic polyester diol-based polyurethane.

34. A bladder according to claim 33, wherein the polyester diol of said polyurethane is a reaction product of a mixture comprising at least one dicarboxylic acid, dicarboxylate ester, or anhydride selected from the group consisting of adipic acid, glutaric acid, succinic acid, malonic acid, oxalic acid, anhydrides of these acids, and mixtures thereof and at least one diol selected from the group consisting of ethylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, dipropylene glycol, tripropylene glycol, tetrapropylene glycol, 1,3-propanediol, 1,4-butanediol, neopentyl glycol, 1,5-pentanediol, 1,6-hexanediol, and mixtures thereof.

35. A bladder according to claim 28, wherein the fluid barrier material comprises a member selected from the group consisting of ethylene vinyl alcohol copolymers, polyvinylidene chloride,

acrylonitrile copolymers, polyethylene terephthalate, polyamides, crystalline polymers, polyurethane engineering thermoplastics, and combinations thereof.

36. A bladder according to claim 28, wherein the fluid barrier material comprises an ethylene-vinyl alcohol copolymer.

37. A bladder according to claim 28, wherein said microlayer polymeric composite includes at least about 50 microlayers.

38. A bladder according to claim 28, wherein said microlayer polymeric composite includes from about 10 microlayers to about 1000 microlayers.

39. A bladder according to claim 28, wherein said microlayer polymeric composite layer includes from about 50 microlayers to about 500 microlayers.

40. A bladder according to claim 28, wherein the average thickness of each fluid barrier material microlayer is independently from about 0.01 micron to about 2.5 microns thick.

41. A bladder according to claim 28, wherein the average thickness of the microlayer polymeric composite layer is from about 75 microns to about 0.5 centimeter.

42. A bladder according to claim 28, wherein said membrane further comprises at least one layer including an elastomeric polyurethane.

43. A bladder according to claim 42, wherein said membrane comprises further layers including an elastomeric polyurethane adjacent to either side of the microlayer polymeric composite layer.

44. A bladder according to claim 28, wherein the bladder is inflated with a gas.

45. A bladder according to claim 28, wherein said bladder is inflated with a gas comprising nitrogen.

46. A bladder according to claim 44, wherein the inflating gas is at a pressure of at least about 3 psi.

47. A bladder according to claim 28, wherein the bladder is permanently sealed.

48. A bladder according to claim 28, wherein the laminar nano-filler has an average thickness of from about 1 nm to about 10 nm and an aspect ratio from about 200 to about 1000.

49. A bladder according to claim 28, wherein the laminar nano-filler is a montmorillonite clay.

50. A bladder according to claim 28, wherein the membrane comprises from about 4 to about 10 weight percent of the laminar nano-filler.

51. A shoe, comprising at least one bladder according to claim 28.

52. A shoe according to claim 51, wherein the bladder is incorporated as a portion of said sole.

53. A shoe according to claim 51, wherein said bladder forms at least a part of an outer surface of said shoe.

54. A ball, comprising a bladder according to claim 28.

EVIDENCE APPENDIX

Evidence entered by examiner and relied on by appellant

Engineering Materials Handbook: Volume 1, Composites, at page 20 (ASM International Handbook Committee, Theodore J. Reinhard, Technical Chairman 1987)

ENGINEERED MATERIALS HANDBOOK ™

Volume 1

COMPOSITES

Prepared under the direction of the
ASM INTERNATIONAL Handbook Committee

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ASM INTERNATIONAL ™

METALS PARK, OHIO 44073

• First printing, November 1987
Second printing, May 1988
Third printing, August 1989

Library of Congress Cataloging in Publication Data

ASM INTERNATIONAL

Engineered materials handbook.

Includes bibliographies and indexes.
Contents: v. 1. Composites.

1. Materials—Handbooks, manuals, etc. I. ASM INTERNATIONAL. Handbook Committee.
TA403.E497 1987 620.1'1 87-19265
ISBN 0-87170-279-7 (v. 1)
SAN 204-7586

Printed in the United States of America

Publication of Volume
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work, diligence, and en
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resin impregnation bath and through a shaping die, where the resin is subsequently cured.

pyrolysis. With respect to fibers, the thermal process by which organic precursor fiber materials, such as rayon, polyacrylonitrile (PAN), and pitch, are chemically changed into carbon fiber by the action of heat in an inert atmosphere. Pyrolysis temperatures can range from 800 to 2800 °C (1470 to 5070 °F), depending on the precursor. Higher processing graphitization temperatures of 1900 to 3000 °C (3450 to 5430 °F) generally lead to higher modulus carbon fibers, usually referred to as graphite fibers. During the pyrolysis process, molecules containing oxygen, hydrogen, and nitrogen are driven from the precursor fiber, leaving continuous chains of carbon.

Q

quasi-isotropic laminate. A laminate approximating isotropy by orientation of plies in several or more directions.

R

random pattern. A winding with no fixed pattern. If a large number of circuits is required for the pattern to repeat, a random pattern is approached. A winding in which the filaments do not lie in an even pattern.

reaction injection molding (RIM). A process for molding polyurethane, epoxy, and other liquid chemical systems. Mixing of two to four components in the proper chemical ratio is accomplished by a high-pressure impingement-type mixing head, from which the mixed material is delivered into the mold at low pressure, where it reacts (cures).

reinforced plastics. Molded, formed, filament-wound, tape-wrapped, or shaped plastic parts consisting of resins to which reinforcing fibers, mats, fabrics, and so forth, have been added before the forming operation to provide some strength properties greatly superior to those of the base resin.

reinforced reaction injection molding (RRIM). A reaction injection molding with a reinforcement added. See also *reaction injection molding*.

reinforcement. A strong material bonded into a matrix to improve its mechanical properties. Reinforcements are usually long fibers, chopped fibers, whiskers, particulates, and so forth. The term should not be used synonymously with filler.

relaxation time. The time required for a stress

mold release agent. Also called parting agent.

release film. An impermeable layer of film that does not bond to the resin being cured. See also *separator*.

residual gas analysis (RGA). The study of residual gases in vacuum systems using mass spectometry.

residual strain. The strain associated with residual stress.

residual stress. The stress existing in a body at rest, in equilibrium, at uniform temperature, and not subjected to external forces. Often caused by the forming and curing process.

resilience. The ratio of energy returned, on recovery from deformation, to the work input required to produce the deformation (usually expressed as a percentage). The ability to regain an original shape quickly after being strained or distorted.

resin. A solid or pseudosolid organic material, usually of high molecular weight, that exhibits a tendency to flow when subjected to stress. It usually has a softening or melting range, and fractures conchoidally. Most resins are polymers. In reinforced plastics, the material used to bind together the reinforcement material; the matrix. See also *polymer*.

resin content. The amount of resin in a laminate expressed as either a percentage of total weight or total volume.

resin pocket. An apparent accumulation of excess resin in a small, localized section visible on cut edges of molded surfaces, or internal to the structure and nonvisible. See also *resin-rich area*.

resin-rich area. Localized area filled with resin and lacking reinforcing material. See also *resin pocket*.

resin-starved area. Localized area of insufficient resin, usually identified by low gloss, dry spots, or fiber showing on the surface.

resin system. A mixture of resin and ingredients such as catalyst, initiator, diluents, and so forth, required for the intended processing and final product.

resin transfer molding (RTM). A process whereby catalyzed resin is transferred or injected into an enclosed mold in which the fiberglass reinforcement has been placed.

resistivity. The ability of a material to resist passage of electrical current either through its bulk or on a surface.

reverse impact test. A test in which one side of a sheet of material is struck by a pendulum or falling object, and the reverse side is inspected for damage.

RGA. See *residual gas analysis*.

rheology. The study of the flow of materials, particularly plastic flow of solids and the flow of non-Newtonian liquids. The science treating the deformation and flow of matter.

rib. A reinforcing member designed into a plastic part to provide lateral, horizontal, hoop, or other structural support.

RIM. See *reaction injection molding*.

rise time. In urethane foam molding, the time between the pouring of the urethane mix and the completion of foaming.

Rockwell hardness. A value derived from the increase in depth of an impression as the load on an indenter is increased from a fixed minimum value to a higher value and then returned to the minimum value. Indenters for the Rockwell test include steel balls of several specific diameters and a diamond cone penetrator having an included angle of 120° with a spherical tip having a radius of 0.2 mm (0.0070 in.). Rockwell hardness numbers are always quoted with a prefix representing the Rockwell scale corresponding to a given combination of load and indenter, for example, HRC 30.

room-temperature curing adhesive. An adhesive that sets (to handling strength) within an hour at temperatures from 20 to 30 °C (68 to 86 °F) and later reaches full strength without heating.

room-temperature vulcanizing (RTV). Vulcanization or curing at room temperature by chemical reaction; usually applies to silicones and other rubbers.

roving. A number of yarns, strands, tows, or ends collected into a parallel bundle with little or no twist.

roving ball. The supply package offered to the winder, consisting of a number of ends or strands wound to a given outside diameter onto a length of cardboard tube. Usually designated by either fiber weight or length in yards.

roving cloth. A textile fabric, coarse in nature, woven from rovings.

RRIM. See *reinforced reaction injection molding*.

RTM. See *resin transfer molding*.

RTV. See *room-temperature vulcanizing*.

S

sandwich constructions. Panels compo lightweight core material, such as comb, foamed plastic, and so forth, to two relatively thin, dense, high-stre high-stiffness faces or skins are adhe

satin. A type of finish having a satin or appearance, specified for plastics or c ites.

satin weave. See *harness satin*.

S-basis. The S-basis property allowabl minimum value specified by the app federal, military, Society of Automo gineers, American Society for Test Materials, or other recognized and a specifications for the material.

SBS. See *short beam shear*.

scarf joint. A joint made by cuttin similar angular segments on two ad and bonding the adherends with the c fitted together. See also *lap joint*.

scrim. A low-cost reinforcing fabric ma continuous filament yarn in an op construction. Used in the processing or other B-stage material to facilit dling. Also used as a carrier of adh be used in secondary bonding.

sealant. A material applied to a joint in liquid form that hardens or cures i forming a seal against gas or liquid

secant modulus. Idealized Young's derived from a secant drawn betw origin and any point on a nonlinea strain curve. On materials whose changes with stress, the secant mo the average of the zero applied str and the maximum stress point being ered. See also *tangent modulus*.

secondary bonding. The joining tog the process of adhesive bonding, o more already cured composite parts which the only chemical or thermal occurring is the curing of the adhesi

secondary structure. In aircraft and a applications, a structure that is not c flight safety.

self-extinguishing resin. A resin fo that will burn in the presence of a f will extinguish itself within a speci after the flame is removed.

self-skinning foam. A urethane foam duces a tough outer surface over a f upon curing.

RELATED PROCEEDINGS APPENDIX

None.